DEPARTMENT OF MATHEMATICS

MATH2000
Assignment 2
Summer 2010-2011

Submit your answers - along with this cover sheet - at the end of your tutorial on Wednesday, December 22, 2010.

Note that you may find some of these problems challenging. Attendance at weekly tutorials is assumed.

Family name:

Given names:

Student number:

Marker's use only

Each question marked out of 3.

- Mark of 0: You have not submitted a relevant answer, or you have no strategy present in your submission.
- Mark of 1: Your submission has some relevance, but does not demonstrate deep understanding or sound mathematical technique. This topic needs more attention!
- Mark of 2: You have the right approach, but need to fine tune some aspects of your calculations.
- Mark of 3: You have demonstrated a good understanding of the topic and techniques involved, with well-executed calculations. A mathematician in the making?

Q1:

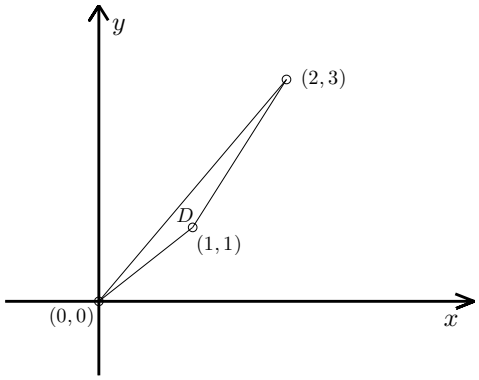
Q2:

Q3:

Q4:

Total (out of 12):

(1) Find the volume of the region between the surface $z = 6x + 24y$ and the region D in the x-y plane indicated in the diagram below.

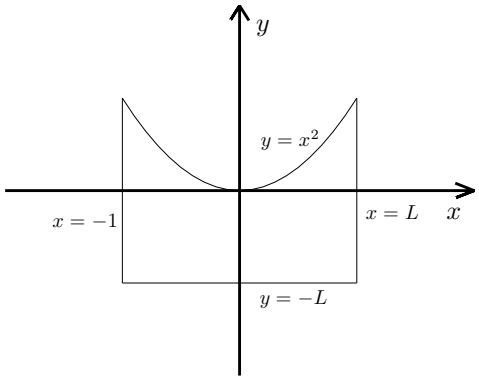


(2) The error function ("erf") is defined as

$$\operatorname{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-u^2} du.$$

Evaluate the definite integral $\displaystyle\int_0^\alpha \operatorname{erf}(x)\, dx$, where $\alpha > 0$, expressing your answers in terms of the error function where appropriate. Show all working.

(3) Consider a two dimensional lamina with constant density occupying the region in the x-y plane shown in the following diagram, with $L \geq 0$.



Find the centre of mass of the lamina for arbitrary, non-negative L, and determine whether or not there is range of values of L for which the centre of mass mass lies outside the region.

(4) Consider the double integral given in terms of polar coordinates $\displaystyle\int_{-\pi/3}^{\pi/3} \int_1^2 r\ dr\ d\theta$. Sketch the region of integration in the x-y plane and evaluate the integral. Note that this integral gives the area of the region.